CLAIMS

1. A turbine blade comprising:

an airfoil integrally joined to a mounting dovetail;

said airfoil including opposite pressure and suction sidewalls joined together at chordally opposite leading and trailing edges and extending longitudinally from root to tip;

a plurality of independent cooling circuits disposed inside said airfoil correspondingly along said pressure and suction sidewall, and each including an inlet channel extending through said dovetail, and a row of outlet holes extending through said sidewalls in flow communication with a corresponding outlet channel thereof; and

one of said cooling circuits including multiple cascade channels separated by corresponding perforate partitions, each including a row of impingement holes for cascade impingement cooling the inner surface of said airfoil.

2. A blade according to claim 1 wherein:

said cooling circuits are separated from each other along said sidewalls by imperforate partitions; and

said inlet channels are separated from said leading edge by one of said cascade channels disposed therebetween.

3. A blade according to claim 2 wherein:

each of said inlet channels includes a corresponding row of said impingement holes inclined through said perforate partition thereof to obliquely impinge cooling air against said airfoil inner surface; and

said cascade channels are arranged in series from said corresponding inlet channels along either said pressure sidewall or said suction sidewall for effecting cascade impingement cooling thereof between said leading and trailing edges.

4. A blade according to claim 3 wherein:

a first one of said cooling circuits extends along said suction sidewall and terminates at

said leading edge;

a second one of said cooling circuits extends along said pressure sidewall and terminates before said trailing edge; and

a third one of said cooling circuits extends along said suction sidewall behind said first cooling circuit, and in parallel with said second cooling circuit, and terminates at said trailing edge.

5. A blade according to claim 4 wherein said first cooling circuit comprises said cascade impingement cooling circuit.

6. A blade according to claim 4 wherein said second cooling circuit comprises said cascade impingement cooling circuit.

7. A blade according to claim 6 wherein said third cooling circuit comprises a serpentine cooling circuit.

8. A blade according to claim 4 wherein said third cooling circuit comprises said cascade impingement cooling circuit.

9. A blade according to claim 8 wherein said second cooling circuit comprises a serpentine cooling circuit.

10. A blade according to claim 4 wherein said first, second, and third cooling circuits each comprise said cascade cooling circuits; and said three inlet channels thereof adjoin each other.

11. A turbine blade comprising:

an airfoil integrally joined to a mounting dovetail;

said airfoil including opposite pressure and suction sidewalls joined together at chordally opposite leading and trailing edges and extending longitudinally from root to tip;

a plurality of independent cooling circuits disposed inside said airfoil correspondingly

along said pressure and suction sidewall, and each including an inlet channel extending through said dovetail; and

one of said cooling circuits including multiple cascade channels separated by corresponding perforate partitions, each including a row of impingement holes for cascade impingement cooling the inner surface of said airfoil.

12. A blade according to claim 11 wherein said cooling circuits are separated from each other along said sidewalls by imperforate partitions.

13. A blade according to claim 12 wherein said inlet channels are separated from said leading edge by one of said cascade channels disposed therebetween.

14. A blade according to claim 13 wherein each of said inlet channels includes a corresponding row of said impingement holes inclined through said perforate partition thereof to obliquely impinge cooling air against said airfoil inner surface.

15. A blade according to claim 14 wherein said cascade channels are arranged in series from said corresponding inlet channels along either said pressure sidewall or said suction sidewall for effecting cascade impingement cooling thereof between said leading and trailing edges.

16. A blade according to claim 15 wherein said one cooling circuit extends along said suction sidewall and terminates at said leading edge.

17. A blade according to claim 15 wherein a second one of said cooling circuits includes multiple cascade channels separated by corresponding perforate partitions, each including a row of impingement holes for cascade impingement cooling said airfoil inner surface chordally therealong.

18. A blade according to claim 17 wherein said one cooling circuit is disposed along said

suction sidewall, and said second cooling circuit is disposed along said pressure sidewall.

19. A blade according to claim 15 wherein:

a second one of said cooling circuits includes multiple cascade channels separated by corresponding perforate partitions each including a row of impingement holes for cascade impingement cooling said airfoil inner surface chordally therealong; and

a third one of said cooling circuits includes multiple cascade channels separated by corresponding perforate partitions each including a row of impingement holes for cascade impingement cooling said airfoil inner surface chordally therealong.

20. A blade according to claim 19 wherein:

said one cooling circuit extends along said suction sidewall and terminates at said leading edge;

said second cooling circuit is disposed along said pressure sidewall and terminates before said trailing edge; and

said third cooling circuit is disposed along said suction sidewall behind said one cooling circuit, and terminates at said trailing edge.

21. A blade according to claim 20 wherein said suction sidewall includes a row of film cooling holes disposed in flow communication with the last channel of said one cooling circuit.

22. A blade according to claim 20 wherein said pressure sidewall includes a row of film cooling holes disposed in flow communication with the last channel of said second cooling circuit.

23. A blade according to claim 20 wherein said third cooling circuit terminates in a row of outlet holes disposed along said airfoil trailing edge.

24. A blade according to claim 15 wherein said pressure and suction sidewalls are

imperforate along said inlet channels.

25. A blade according to claim 15 wherein said pressure and suction sidewalls are imperforate along said cooling circuits except at the corresponding last channel thereof having a row of outlet holes.

26. A blade according to claim 15 wherein another one of said cooling circuits includes multiple longitudinal channels arranged end-to-end to form a continuous serpentine channel.

27. A blade according to claim 26 wherein said cascade cooling circuit is disposed along said airfoil suction sidewall, and said serpentine cooling circuit is disposed along said pressure sidewall in parallel therewith.

28. A blade according to claim 26 wherein said cascade cooling circuit is disposed along said airfoil pressure sidewall, and said serpentine cooling circuit is disposed along said suction sidewall in parallel therewith.